```
┌──────────┐          ┌──────────────┐          ┌──────────────┐
│          │          │   Modified   │          │              │
│  Client  │─────────▶│    Router    │─────────▶│ Intermediary │
│          │          │  (optional)  │          │              │
└──────────┘          └──────────────┘          └──────────────┘
                                                        ▲
                                                        │
                                                 ┌──────────────┐
                                                 │ Proxy Client │
                                                 └──────────────┘
                                                        │
                                                        ▼
                                                 ┌──────────────────┐
                                                 │ Service Providing │
                                                 │     Machine       │
                                                 └──────────────────┘
```

Source Datagram

Intermediary

Proxy Client

Application
Datagram

Application
Datagram

Application
Datagram

Requests for Service

Service Responses

Client

Client

Server

Server

Source Datagram

Modified Router

Intermediary

Proxy Client

Network Datagram

Network Datagram

Virtual Address Header

Intermediary Datagram

Network Datagram

Proxy Client Datagram

Network Datagram

Requests for Service

Service Responses

Client

Server

Server

Client

Application Layer
(HTTP, SMTP, POP3, FTP etc..)

Transport Layer
(TCP, UDP)

Network Layer
(IP, ICMP, IGMP)

Embodiment 2: Network-to-Network
Communication at Network Layer

Application Layer
(HTTP, SMTP, POP3, FTP etc..)

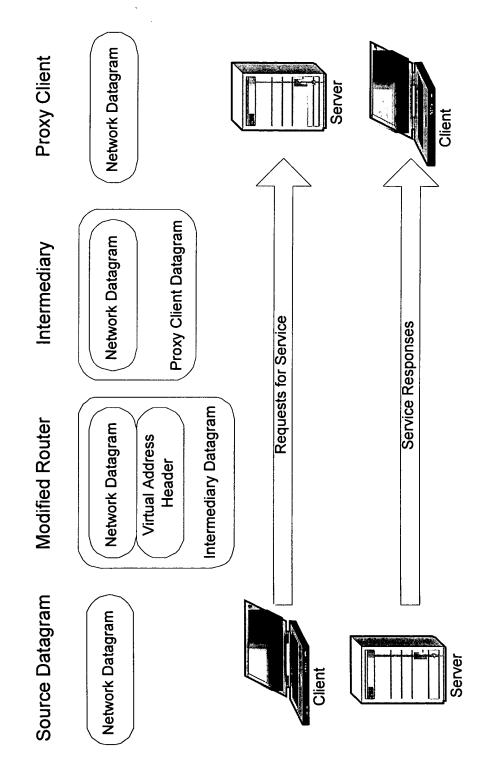Embodiment 1: Point-to-Point
Communication at Application Layer

Application Layer
(HTTP, SMTP, POP3, FTP etc..)

Transport Layer
(TCP, UDP)

Network Layer
(IP, ICMP, IGMP)

Link Layer
(Ethernet, Serial Link etc..)

The 4 Network Layers

Joe Bloggs
67.227.117.77

56k Dial-up
Connection

The Internet

Intermediary server
on the Internet (www.gkn.net)
65.225.115.65

Dedicated T1
Connection

The orang.com main office
Private Network
(1.251.174.0)

Restrictive Firewall (out only)
1.251.174.1, 64.224.114.64

1.251.174.0

mail server
(mail.orang.com)
1.251.174.155

network router
1.251.174.158

proxy client
1.251.174.156

web server
(www.orang.com)
1.251.174.157

Client	Intermediary	Proxy Client	Server
		Register Virtual Address (VA)	
	VA Authenticated? — No →	Warn Administrator of Connection Error	
	Yes ↓ Keep Open Proxy Client Connection and wait for client requests		
Send a request for service to a virtual address on the Intermediary	Interpret Request to identify Correct Proxy Client Connection		
	Transform the Request VA to a Real Application Address Request		
	Send Request to waiting Open Proxy Client Connection	Receive Client Request	
		Open a Client Connection to the Server and Send through the Request	Receive Request, Interpret, Action and Send back the Response
	Receive Server Response	Receive Response and Return to Intermediary through Open Connection	
	Translate any Real Application Addresses into Virtual Addresses		
Receive Response	Return Response to Client		
Break Connection with Intermediary	Break Connection with Proxy Client	Start a new Proxy Client Connection and Registration Process	

The Internet

Intermediary server on the
Internet (www.gkn.net)
65.225.115.65

Fred Smith
192.168.22.98   modified router
                 192.168.22.99   proxy client
                                  192.168.22.100

192.168.22.0

ISDN 128k
Connection

Restrictive Firewall
192.168.22.1,
63.223.113.63

orang.com satellite
office private network
(192.168.22.0)

Dedicated T1
Connection

Restrictive Firewall
(out only)
1.251.174.1,
64.224.114.64

web server
(www.orang.com)
1.251.174.157

1.251.174.0

proxy client
1.251.174.156

modified router
1.251.174.158

mail server
(mail.orang.com)
1.251.174.155

The orang.com main
office Private Network
(1.251.174.0)

Client[c] Server[s]	Modified Router[c] Modified Router[s]	Intermediary	Proxy Client[s] Proxy Client[c]

A

Register Virtual Address (VA)

VA Authenticated? — No → Warn Administrator of Connection Error

Yes

Keep Open Proxy Connection and wait for client requests

Send a network datagram destined for the opposite network (routed via the Modified Router)

B

Add a Virtual Address Header and authentication data for the opposite network

Interpret Request Header to identify Correct Proxy Client Connection

Drop Modified Router Header and wait for encapsulated datagram

Datagram Routed to Modified Router at the Link Layer

Send encapsulated datagram to **Opposite Newtork** through Open Proxy Client Connection

Receive network datagram

Datagram Repeated on Opposite Network

Receive datagram, interpret, action and reply with a datagram destined for the **Opposite Network**

Repeat the datagram through the physical link layer

Break Connection to Intermediary and Start a Fresh Registration Process

A